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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/773,187	02/09/2004	Kia Silverbrook	MTB31US	8432

24011 7590 08/16/2006

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EXAMINER	
FIDLER, SHELBY LEE	

ART UNIT	PAPER NUMBER
2861	

DATE MAILED: 08/16/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/773,187	SILVERBROOK, KIA	
	Examiner	Art Unit	
	Shelby Fidler	2861	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *05 June 2006*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,3-19,21-38 and 40-54* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,3-19,21-38 and 40-54* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *09 February 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *6/5/2006*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Specification

The specification is objected to as failing to provide proper antecedent basis for the claimed subject matter. See 37 CFR 1.75(d)(1) and MPEP § 608.01(o). Correction of the following is required: the terminology of the heating element being configured such that the energy required to heat the heating element to eject a drop is less than the energy required to heat a volume of ejectable liquid equal to the volume of a drop, from a temperature equal to an ambient temperature to the boiling point is not disclosed in the specification.

Appropriate correction is required.

Claim Objections

Claims 1, 18, and 38 are objected to because of the following informalities: the claims contain the phrase "from eachother" (e.g. line 12 of claim 1). Appropriate correction is required.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1, 5, 6, 8, 10-14, 19, 23-25, 27, 29-33, 38, 42-44, and 46-50 are rejected under 35 U.S.C. 103(a) as being unpatentable over Silverbrook (US 6019457) in view of Campbell et al. (US 4870433).

Regarding claims 1, 19, and 38

Silverbrook teaches:

a printing system (*Figure 116*) with an inkjet printhead (*col. 5, lines 60-61*) comprising:

a plurality of nozzles (*col. 1, lines 64-65*), each defining a nozzle aperture having a central axis (*Z-axis, col. 2, lines 53-56*);

a bubble forming chamber (*chamber 113*) corresponding to each of the nozzles respectively (*Figure 9*);

at least one heater element (*heater 120*) disposed in each of the bubble forming chambers respectively (*Figure 9*), the heater element configured for thermal contact with a bubble forming liquid (*ink 106; Figure 12*); such that

heating the heater element to a temperature above the boiling point of the bubble forming liquid forms a gas bubble that causes the ejection of a drop of an ejectable liquid through the nozzle corresponding to that heater element (*col. 9, lines 26-28*); wherein,

the heater element (*heater 440, Figure 10*) is configured to nucleate the gas bubble at two or more regions (*main heater 441 and redundant heater 443, Figure 13 with col. 9, lines 30-33*) such that each nucleation region is laterally offset from the nozzle aperture (*each is offset from nozzle aperture 445, Figure 13*).

Further Regarding claim 38, Silverbrook teaches:

supplying the nozzle with a replacement volume of the ejectable liquid equivalent to the ejected drop (*col. 12, lines 59-61*).

Silverbrook does not expressly teach:

the heater element has two bubble nucleation regions laterally offset from a central axis of the nozzle aperture, the lateral offset of one of the bubble nucleation regions being equal and opposite to the lateral offset of the other bubble nucleation region;

wherein the bubble nucleation regions are spaced from each other such that bubbles nucleated at each will grow until they unite to form the gas bubble that causes the ejection of a drop of ejectable liquid.

Campbell et al. teach:

the heater element (heater element 12) has two bubble nucleation regions (elongated portions 23) laterally offset from a central axis of the nozzle aperture (Fig. 1), the lateral offset of one of the bubble nucleation regions being equal and opposite to the lateral offset of the other bubble nucleation region (Fig. 1); and

wherein the bubble nucleation regions are spaced from each other such that bubbles nucleated at each will grow until they unite to form the gas bubble that causes the ejection of a drop of ejectable liquid (col. 3, lines 50-60).

At the time of invention, it would have been obvious to a person of ordinary skill in the art to utilize offset nucleation regions into Silverbrook's invention. The motivation for doing so, as taught by Campbell et al., is to prevent cavitational damage to the heater elements (*col. 3, lines 14-23*).

Regarding claims 5, 24, and 42, Silverbrook teaches:

the bubble forming liquid and the ejectable liquid are of a common body of liquid (*col. 9, lines 26-30*).

Regarding claims 6, 25, and 43, Silverbrook teaches:

the printhead is configured to print on a page and to be a page-width printhead (*col. 2, lines 19-22*).

Regarding claims 8, 27, and 44, Silverbrook teaches:

each heater element is configured such that an actuation energy of less than 500 nanojoules is required to be applied to that heater element to heat that heater element sufficiently to form the bubble in the bubble forming liquid thereby to cause the ejection of the drop (*col. 19, lines 8-10*).

Regarding claims 10, 29, and 46, Silverbrook teaches:

the printhead comprises a substrate having a substrate surface, wherein the areal density of the nozzle relative to the substrate surface exceeds 10,000 nozzles per square cm of substrate surface (*using the reference measurement of Figure 43 and counting the individual nozzles disclosed in the "part of cyan" section of Figure 43, calculations show that the density exceeds 10,000 per square cm:* $\frac{20 nozzles}{0.0016384 cm^2} = 12207 \frac{nozzles}{cm^2}$).

Regarding claims 11, 30, and 47, Silverbrook teaches:

each heater element (*element 120, Figure 17*) has two opposite sides (*left and right sides of chamber respectively, Figure 17*) and is configured such that the gas bubble formed by that heater element is formed at both of the sides of that heater element (*bubble 198 formed on both sides of chamber, corresponding to both sides of element 120, Figure 17*).

Regarding claims 12, 31, and 48

Silverbrook teaches all claimed limitations except:

each heater element is configured such that the point of collapse of a bubble formed thereby is spaced from that heater element.

Campbell et al. teaches:

each heater element is configured such that the point of collapse of a bubble formed thereby is spaced from that heater element (*col. 3, lines 60-64*).

Regarding claims 13, 32, and 50, Silverbrook teaches:

the printhead comprising a structure that is formed by chemical vapor deposition , the nozzles being incorporated on the structure (*col. 5, lines 47-49*).

Regarding claims 14, 33, and 49, Silverbrook teaches:

the printhead comprising a structure which is less than 10 microns thick, the nozzles being incorporated on the structure (*col. 9, lines 8-10*).

Regarding claim 23, Silverbrook teaches:

the system is configured to support the bubble forming liquid in thermal contact with each heater element (*col. 17, lines 37-43*), and to support the ejectable liquid adjacent each nozzle (*col. 17, lines 37-40*).

Claims 3, 21, and 40 are rejected under 35 U.S.C. 103(a) as being unpatentable over Silverbrook (US 6019457) as modified by Campbell et al. (US 4870433), as applied to claims 1, 19, and 38 above, and further in view of Gerber et al. (US 6680668 B2).

Regarding claims 3, 21, and 40

Silverbrook as modified by Campbell et al. teach:

the heater element has two parallel spans (*horizontal spans of elongated portions 23*) disposed on either side of the nozzle aperture axis (*Fig. 1*), such that each of the spans has one of the bubble nucleation regions (*col. 3, lines 50-52 of Campbell et al.*).

Silverbrook as modified by Campbell et al. do not expressly teach:

the heater element is suspended.

Gerber et al. teaches the following:

the heater element is suspended (*col. 4, lines 31-32*).

At the time of invention, it would have been obvious to a person of ordinary skill in the art to utilize suspended heater elements in the invention of Silverbrook as modified by Campbell et al. The motivation for doing so, as taught by Gerber et al., is so that the resistor will quickly increase in temperature since the heat is not absorbed by the substrate (*col. 4, lines 32-38*)

Claims 4, 7, 15, 16, 18, 22, 26, 34, 35, 37, 41, 51, 52, and 54 are rejected under 35 U.S.C. 103(a) as being unpatentable over Silverbrook (US 6019457) as modified by Campbell et al. (US 4870433), as applied to claims 1, 19, and 38 above, and further in view of Anagnostopoulos et al. (US 6502925 B2).

Regarding claims 4, 7, 22, 26, and 41

Silverbrook as modified by Campbell et al. teach all limitations except:

the heater element is formed predominately from titanium nitride.

Anagnostopoulos et al. teach:

the heater element is formed predominately from titanium nitride (*col. 10, lines 32-34*).

At the time of invention, it would have been obvious to a person of ordinary skill in the art to utilize predominantly titanium nitride heater elements into the invention of Silverbrook as modified by Campbell et al. The motivation for doing so, as taught by Chan (US 5870121), is to take advantage of the highly stable and highly resistive characteristics of TiN (col. 5, lines 11-22).

Regarding claims 15, 34, and 51

Silverbrook as modified by Campbell et al. teach:

a plurality of nozzle chambers each corresponding to a respective nozzle (*col. 7, lines 42-44 of Silverbrook*).

Silverbrook as modified by Campbell et al. do not expressly teach:

a plurality of heater elements being disposed within each chamber, the heater elements within each chamber being formed on different respective layers to one another.

Anagnostopoulos et al. teach:

a plurality of heater elements being disposed within each chamber, the heater elements within each chamber being formed on different respective layers to one another (*col. 8, lines 36-38*).

At the time of invention, it would have been obvious to a person of ordinary skill in the art to utilize heater elements formed on different layers into the invention of Silverbrook as modified by Campbell et al. The motivation for doing so, as taught by Anagnostopoulos et al., is so that the heaters can be fired simultaneously or activated at different times (col. 8, lines 42-47).

Regarding claims 16, 35, and 52

Silverbrook as modified by Campbell et al. teach all limitations except:

each heater element is formed of solid material more than 90% of which, by atomic proportion, is constituted by at least one periodic element having an atomic number below 50

Anagnostopoulos et al. teach:

each heater element is formed of solid material more than 90% of which, by atomic proportion, is constituted by at least one periodic element having an atomic number below 50 (*Ti and TiN, col. 10, lines 31-33*)

Regarding claims 18, 37, and 54

Silverbrook as modified by Campbell et al. teach:

each heater element has a conformal protective coating (*passivation layer 17*) on any parts exposed to the bubble forming liquid (*col. 2, lines 61-65 and Fig. 2 of Campbell et al.*).

Silverbrook as modified by Campbell et al. teach all limitations except:

the coating of each heater element having been applied substantially to all sides of the heater element simultaneously such that the coating is seamless.

Anagnostopoulos et al. teach:

the coating (*protection layer; col. 10, lines 26-28*) of each heater element having been applied substantially to all sides of the heater element simultaneously such that the coating is seamless (*col. 10, lines 26-39 with Figure 5*)

At the time of invention, it would have been obvious to a person of ordinary skill in the art to utilize a seamless coating applied substantially to all sides of the heater element into the invention of Silverbrook as modified by Campbell et al. The motivation

for doing so, as taught by Anagnostopoulos et al., is to provide protection against mechanical abrasion (col. 10, lines 36-40).

Claims 9, 28, and 45 are rejected under 35 U.S.C. 103(a) as being unpatentable over Silverbrook (US 6019457) as modified by Campbell et al. (US 4870433), as applied to claims 1, 19, and 38 above, and further in view of Tajima et al. (US 5867200).

Regarding claims 9, 28, and 45

Silverbrook as modified by Campbell et al. teach:

the printhead is configured to receive a supply of ejectable liquid (*ink*) at an ambient temperature (*col. 13, lines 47-50 of Silverbrook shows that the supplied ink is cooler than the operating ink since it cools the printhead*)

Silverbrook as modified by Campbell et al. do not expressly teach:

each heater element is configured such that the energy required to be applied thereto to heat the part of cause the ejection of a drop is less than the energy required to heat a volume of the ejectable liquid equal to the volume of the drop, from a temperature equal the ambient temperature to the boiling point

Tajima et al. teaches the following:

each heater element is configured such that the energy required to be applied thereto to heat the part to cause the ejection of a drop is less than the energy required to heat a volume of the ejectable liquid equal to the volume of the drop, from a temperature equal the ambient temperature to the boiling point (*col. 2, lines 38-49 shows that a pre-heat pulse of energy is required to heat the ambient temperature before applying the*

ejection pulse of energy; therefore, less energy is required when the ink is not at ambient temperature and no pre-heat pulse is required)

At the time of invention, it would have been obvious to a person of ordinary skill in the art to utilize pre-heating pulses in the invention of Silverbrook as modified by Campbell et al. The motivation for doing so, as taught by Tajima et al., is to eject a droplet of a predetermined amount (*col. 2, lines 47-49*).

Claims 17, 36, and 53 are rejected under 35 U.S.C. 103(a) as being unpatentable over Silverbrook (US 6019457) in view of Campbell et al. (US 4870433).

Regarding claims 17, 36, and 53

Silverbrook as modified by Campbell et al. teach the following:

each heater element includes solid material (*HfB_2; col. 9, lines 24-26 of Silverbrook*)

Silverbrook as modified by Campbell et al. do not expressly teach:

each heater element is configured for a mass of less than 10 nanograms of the solid material of that heater element to be heated to a temperature above the boiling point thereby to heat the part of the bubble forming liquid to a temperature above the boiling point to cause the ejection of a drop.

At the time of invention, it would have been obvious to a person of ordinary skill in the art to configure the heater element for a mass of less than 10 nanograms of the solid material to be heated, since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. In re Boesch, 617 F.2d 272, 205 USPQ 215 (CCPA 1980). The motivation for doing so, would be to use less materials.

Response to Arguments

Applicant's arguments with respect to claims 1, 3-19, 21-38, and 40-54 have been considered but are moot in view of the new ground(s) of rejection. Please see above rejection to Silverbrook (US 6019457) in view of Campbell et al. (US 4870433), which teaches a heater with two bubble nucleation regions in the chamber. The nucleation regions are laterally offset from the central axis of the nozzle, each region being offset an equal and opposite distance to each other.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Communication with the USPTO

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Shelby Fidler whose telephone number is (571) 272-8455. The examiner can normally be reached on MWF 8:30-5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Vip Patel can be reached on (571) 272-2458. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

SF 8/8/06

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